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Note

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Who Is Mrs. Cantlie and Why Are They Doing Those Terrible Things to Her Homunculi?

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A survey of 1987 introductory psychology texts revealed an unusually high error rate for homunculus illustrations. The resulting search for the source of these errors led back to the use of some homunculus drawings by Mrs. H. P. Cantlie (see Penfield & Rasmussen, 1950).

If you teach introductory psychology or have some introductory psychology texts at hand, choose one at random. Examine the section on the brain. Look for *homunculi*—those strange drawings of distorted human anatomy in which the size of the body part is proportional to its area in the motor or somatosensory cortex and not its actual size. If homunculi are used to illustrate both the motor and somatosensory cortical areas, check their accuracy. It is very likely that you will find an error (e.g., the left hemisphere will be indicated, but the homunculus will be for the left side of the body instead of the right side).

Why is there such a high error rate for these illustrations? My interest in this question was piqued when in the second printing of Myers's *Psychology* (1986), several errors in the physiological illustrations were corrected, but the errors in the homunculi were not. Before this happened, I had the subjective feeling that many of the homunculi in introductory texts were inaccurate, but I had not conducted a very objective study of this problem. Myers's text is excellent and one of the most popular for the introductory course. If the homunculi in this text are incorrect, then inaccurate homunculi might be a problem in other introductory texts. So I decided to conduct a more objective study.

Because my copies of the 1987 batch of introductory psychology texts were conveniently located in a stack ready for transfer to a closet in preparation for the onslaught of 1988 introductory texts, I decided to use the 1987 texts for my study. I had 21 such texts (some new editions; some new texts). This set of texts is probably close to an exhaustive sample of the introductory texts for 1987.

Of the 21, 7 did not include homunculi and 2 used only a motor homunculus, which was correct in both cases. However, in the texts that used both motor and somatosensory homunculi, 11 of the 12 contained errors! Five had one side of the body paired with the opposite side of the face within the same homunculus, and 6 indicated a particular hemisphere but depicted the wrong side of the body and face for that hemisphere.

Having more firmly established the existence of these errors, I decided to attempt to identify their origin. When a reference source was cited for the homunculi, invariably it was Penfield and Rasmussen (1950). After a brief search, I found a copy of this book in my university's medical school library. I discovered that the original source for these homunculi was a certain Mrs. H. P. Cantlie, who had provided a combined sensory and motor homunculus for an earlier article by Penfield and Boldrey (1937). Because of some inaccuracies in the earlier combined homunculus, Mrs. Cantlie provided the separate sensory and motor homunculi for the Penfield and Rasmussen (1950) book (see Figures 17 and 22, respectively; they are also repeated in Figures 114 and 115).

Mrs. Cantlie's two homunculi appear to be for the same hemisphere but from postcentral (for the sensory homunculus) and precentral (for the motor homunculus) gyral views of the left hemisphere. However, they are not explicitly labeled as such in the figure captions. Thus, the precentral gyral view of the left hemisphere might be misinterpreted as the right hemisphere. Such a misrepresentation is enhanced by the fact that Penfield and Rasmussen invite the reader to compare these two figures with an earlier figure (Figure 9) in which both left and right hemispheres are depicted. The authors' purpose for this comparison was to examine size and sequencing for the various body parts in each type of cortex and had nothing to do with particular hemispheres.

Clearly, adaptation of the homunculi found in the Penfield and Rasmussen book for introductory psychology texts could lead to errors. However, it does not seem plausible that the Penfield and Rasmussen presentation is responsible for all of the various types of errors that have appeared. It is more likely that some of the errors (especially those in which one side of the body is paired with the opposite side of the face within the same homunculus) have resulted from adaptations from secondary sources, such as other introductory texts. The resulting inaccurate homunculi comprise a good example of what not to do in writing texts. Adapting secondary sources may not only perpetuate an error but may also compound it. Also, such use of secondary sources probably plays a major role in the commonality of topics and illustrations across introductory psychology texts. It almost seems that the primary sources for any new introductory text are the existing introductory texts.

Another matter that I have not resolved but wish to share with you concerns the appearance of a seemingly female breast in some of the homunculi, usually a left breast in the motor homunculus. It did not appear in Mrs. Cantlie's original homunculi. It did, however, appear in about 25% of the 1987 texts depicting both homunculi. There is nothing in Mrs. Cantlie's original motor homunculus that would lead to this addition (Penfield & Rasmussen, 1950). I did find such a breast in Geschwind's 1979 *Scientific American* article on the brain (cited in Hebb & Donderi, 1987). (Even Geschwind has the errors described earlier in his homunculi.) Thus, Geschwind's article is a likely source of the breast (and maybe the errors) appearing in the 1987 texts. Geschwind probably adapted his homunculi from some earlier source, but provides no reference. However, I would like to think that somewhere

along the way Mrs. Cantlie has ghostdrawn these homunculi with breasts in order to reduce the sexual bias prevalent in her earlier drawings. (Have you ever noticed the male genitals in them?) And why not? Her homunculi have come a long way.

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